

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS

PATENT OF THE UNITED STATES IS:

1. A laminated glazing material with properties of acoustic insulation and mechanical strength, said glazing material comprising two glass sheets and a single-ply intermediate layer in the form of a polymeric film and having a thickness, wherein the thickness of the intermediate layer is equal to at least  $d_{ref} \cdot J_{ref}/J_c$ , where:

$J_c$  is a critical energy value specific to a material of the intermediate layer and representative of an energy necessary for propagation of a crack initiated in the intermediate layer;

$J_{ref}$  is a reference critical energy value which corresponds to a critical energy value of a polyvinyl butyral (PVB) film and is equal to  $35,100 \text{ J/m}^2$  for a temperature of  $20^\circ\text{C}$  and for a drawing rate of  $100 \text{ mm/min}$  applied to the PVB film; and

$d_{ref}$  is a reference thickness which corresponds to that of the PVB film and is equal to  $0.38 \text{ mm}$ .

2. The laminated glazing material according to Claim 1, wherein the intermediate layer satisfies acoustic property criteria defined by a bar of  $9 \text{ cm}$  length and  $3 \text{ cm}$  width, made of laminated glass comprising two glass sheets of  $4 \text{ mm}$  thickness joined by the intermediate layer having a thickness of  $2 \text{ mm}$ , has a critical frequency which differs at most by  $35\%$  from that of a glass bar having a same length, a same width and a thickness of  $4 \text{ mm}$ .

3. The laminated glazing material according to Claim 1, wherein the intermediate layer has a loss factor greater than  $0.6$  and a shear modulus of between  $1 \times 10^8$  and  $2 \times 10^7 \text{ N/m}^2$  in a temperature range of between  $10$  and  $60^\circ\text{C}$  and in a frequency range of between  $50$  and  $10,000 \text{ Hz}$ .

4. A laminated glazing material with properties of acoustic insulation and mechanical

strength, said laminated glazing material comprising two glass sheets and a single-ply intermediate layer, wherein the intermediate layer is made of a composite material, said composite material comprising a polymer and reinforcing fibers embedded in the polymer.

5. The laminated glazing material according to Claim 4, wherein the intermediate layer satisfies acoustic property criteria defined by a bar of 9 cm length and 3 cm width, made of laminated glass comprising two glass sheets of 4 mm thickness joined by the intermediate layer having a thickness of 2 mm, has a critical frequency which differs at most by 35% from that of a glass bar having a same length, a same width and a thickness of 4 mm.

6. The laminated glazing material according to Claim 4, wherein the intermediate layer has a loss factor greater than 0.6 and a shear modulus of between  $1 \times 10^8$  and  $2 \times 10^7$  N/m<sup>2</sup> in a temperature range of between 10 and 60°C and in a frequency range of between 50 and 10,000 Hz.

7. A polymer film having a thickness for use as an intermediate layer of a laminated glazing material, wherein the thickness is equal to at least  $d_{ref} J_{ref}/J_c$ , where:

$J_c$  is a critical energy value specific to a material of the intermediate layer and representative of an energy necessary for propagation of a crack initiated in the intermediate layer;

$J_{ref}$  is a reference critical energy value which corresponds to the critical energy value of a polyvinyl butyral (PVB) film and is equal to 35,100 J/m<sup>2</sup> for a temperature of 20°C and for a drawing rate of 100 mm/min applied to the PVB film; and

$d_{ref}$  is a reference thickness which corresponds to that of the PVB film and is equal to 0.38 mm.

8. A polymer film for use as an intermediate layer of a laminated glazing material, wherein the polymer film is a composite comprising a polymer and reinforcing fibers

embedded in the polymer.

9. A process for evaluating a tearing strength of a polymer film of thickness  $d_1$ , for use as an intermediate layer of a laminated glazing material, said process comprising the steps of:

determining a critical energy value  $J_c$  of the intermediate layer, the critical energy value representing an energy necessary for propagation of a crack initiated in the intermediate layer;

calculating a critical energy value  $\tilde{J}_c$  relative to the thickness using a relationship  $\tilde{J}_c = J_c d_1$ ;

comparing  $\tilde{J}_c$  with a reference value  $\tilde{J}_{ref}$ , representative of a polyvinyl butyral film of 0.38 mm thickness and equal to 13.3 J/m; and

determining when the intermediate layer satisfies a tearing strength criterion when  $\tilde{J}_c > \tilde{J}_{ref}$ .